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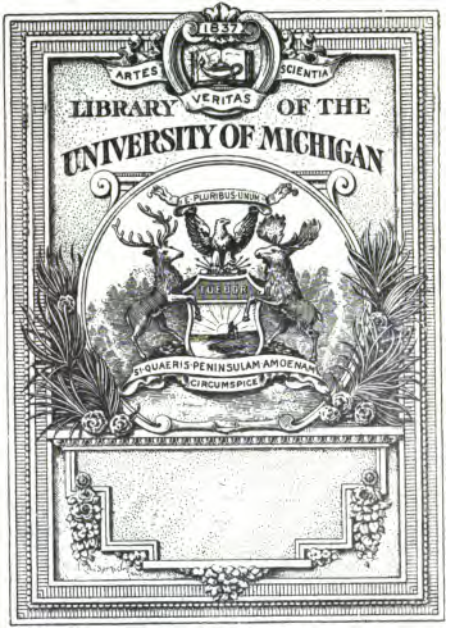
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SCIENCE

OF

TONE PRODUCTION

REVISED EDITION

By

Georges Antoine Brouillet, D.M.D.

BOSTON, MASSACHUSETTS, U. S. A.
429 Boylston Street
1914

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THIS HUMBLE VOLUME
IS AFFECTIONATELY DEDICATED
TO CHILDHOOD
THE SOURCE OF MY BEST INSPIRATIONS AND MY HAPPIEST MOMENTS

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PREFACE

This work is designed to present some facts and principles of the physiology and psychology of the vocal organs in language so clear and concise that almost any one may intelligently exercise these organs so that the voice may be guarded, or, if lost, recovered in a comparatively short time, and cultivated for artistic achievements.

While most of the illustrations are anatomically correct, some are diagrammatically drawn for the special purpose of conveying a practical idea of the physiological actions of the vocal organs. There are many extensive and reliable text-books on human anatomy, physiology, psychology, and hygiene from which a student may gain more knowledge if he should care to go deeply into these studies. My present

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object is to establish the science and the art of tone production on a clear and logical basis and at the same time to make the principles so easily comprehended that a person of intelligence may get a sufficient understanding of the workings and uses of the voice at the least possible expenditure of time and mental effort, so that the course may be speedy and pleasurable and the result an increase of health and happiness.

CONTENTS

CHAPTER		PAGE
	INTRODUCTION	13
I.	ANATOMY OF THE VOCAL ORGANS	19
II.	PHYSIOLOGY AND PSYCHOLOGY OF THE VOCAL ORGANS	24
III.	THE POWER	29
IV.	THE CONTROL	42
V.	THE ADJUSTMENT	47
VI.	THE REGISTERS	54
VII.	THE VOCAL CORDS AND THE HARMONICS	66
VIII.	BALANCE OF POWER	72
IX.	THE TIMBRE	80
X.	FALSETTO	83
XI.	SOUNDING BOARD	86
XII.	RESONANCE CHAMBER	90
XIII.	THE VOICE	97
XIV.	SPEAKING	103
XV.	THE TEACHER	114
XVI.	THE PUPIL	120
XVII.	THE CHILD'S VOICE	125
XVIII.	HYGIENE	132

LIST OF ILLUSTRATIONS

PLATE		PAGE
1.	Original plate, illustrating the most important parts of the vocal organs . . .	20
2.	Original plate, showing the four types of lungs as found in practical anatomy .	30
3.	Original plate, showing the lungs, the bronchial tubes, and the air cells . . .	34
4.	Original plate, illustrating various movements of the tension exercise	37
5.	Original plate, showing the human trunk, the ribs and their flexible ligaments . .	39
6.	The lungs, the air cells, the bronchial tubes, the windpipe, and the larynx . .	43
7.	Original exercise for the adjustment . . .	48
8.	Exercise for the adjustment	49
9.	Original plate, intended to familiarize the pupil with the location of the power for the various pitches of the human voice .	50
10.	Original plate, illustrating the three bronchial tube branches and their controlling muscles	55

PLATE PAGE

11. Original exercise for individual action of the registers 58
12. Original exercise to balance the voice . . 73
13. Original exercise for blending the qualities of the three registers into one another . 75
14. Exercises for the development of the timbre 93
15. Exercise for an even application of the controlling force 98
16. Exercise for the control and limberness of the voice 99
17. Original plate, showing the front and the profile view of the mouth in the articulation of the vowels 105
18. A list of letters, syllables, and words on which the articulating organs should be drilled 108
19. Exercise for singing and speaking with full lungs 139
20. Exercise for an extra fine adjustment . . 139

INTRODUCTION

Nature gives to every child the art of tone production, but few in the civilized world retain it long on account of our artificial way of living. It may be regained through the science of tone production.

Science is systematized knowledge, the understanding of causes and effects. It is acquired through the intellect.

Art is applied knowledge, the skill and power to perform that which might have been scientifically acquired, or it may have been inherited. A person of inferior mentality might possess the art, but could not master the science. Those who have the art need the science to protect them from the usual tendency to deterioration, and

an adult who has lost the art can hardly ever recover it without the science.

The immediate success of the great conservatories of music does not depend on the science of tone production, and they need not teach it because they usually take as pupils only natural artists. Such pupils need only the limbering voice exercises and a suitable training for the interpretation of the authors. The same course with pupils who have lost the natural art would be artistically undesirable and, many times, physically harmful.

The natural voice is usually lost by misuse or non-use of some parts of the vocal organs. These parts, from want of exercise, become weak, sometimes diseased. The strength and the health should be restored by a proper system of breathing exercises and healthy habits. At the same time there should be sufficient knowledge of the physiology and

anatomy of the vocal organs in order that their natural action may be understood and recovered. The study of psychology helps in understanding how some parts of the vocal organs are not brought into action by muscular force but through the power of the mind. Other parts are best brought into activity through the subconscious mind by reflex action. All conscious exertion towards controlling the parts intended by Nature to be motored by the subconscious is a useless physical tax and most injurious to the quality of the voice.

The knowledge of anatomy, physiology, and psychology is, then, the basis of the science of tone production.

It has been proved that a person having a weak and otherwise defective voice can, in a few months, become capable of competing with those who naturally have the art of tone production. In many ways the

scientific person has the advantage over others. He can better guard himself from deterioration. He can intelligently analyze, enjoy, and help others in the science and art of tone production. It is to such a person that the medical practitioner should send his patients who are in need of hygienic treatment for the nose, the throat, or the lungs. The science of tone production and the practice of the art should be among the requisites of a person selected to teach children in public schools. The quality of the voice has much to do with one's social and professional success in life, and the example of a teacher has a great influence over the physical and artistic development of children. Besides, the natural use of the vocal organs would be the most effective means of fighting all lung and throat troubles, especially tuberculosis. While it is conceded that healthy lungs and

throat are necessary to a good voice, it is reasonable to conclude that a sufficient amount of exercise in the natural way of using the voice is the best means of assuring the health and strength of these organs.

QUESTIONS FOR TOPICAL REVIEW

What is the science of tone production?

What is the art of tone production?

Could any one, without the science, be an artist in tone production?

Could any one, without the art, have the science of tone production?

Could an artist, without the science, be a successful teacher in the art of tone production?

Why would the artist without the science be competent to teach only pupils who have retained the natural voice?

How is the natural use of the voice physically beneficial?

CHAPTER I

Anatomy of the Vocal Organs

When the vocal organs are segregated from the rest of the human anatomy, they appear to be a complete and independent system. We know that their health and strength are dependent on the welfare of the general organism, but it is not necessary to go into the study of the whole human anatomy to get the needed anatomical knowledge and a practical understanding of their physical and mechanical action.

As we look at Plate No. 1, we infer from the general appearance of the illustration that the mechanism seems appropriate for the production of musical tones.

Like the rest of the human organism, the vocal organs are wonderful in their perfection, and in power and effect excel all

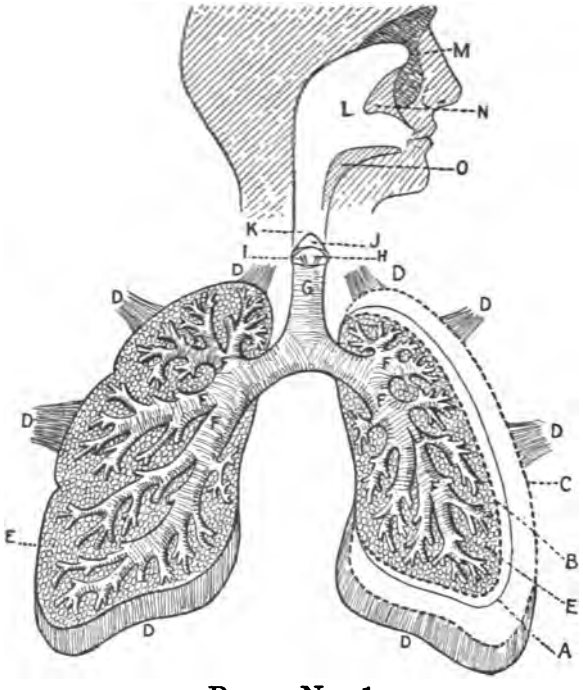


PLATE No. 1

Original plate, illustrating the most important parts of the vocal organs

mechanical musical devices, in imitating their action and the readiness to pass from a display of great strength to the most

exquisite softness in melodious tones. They are as interesting in their complex arrangement as they are in their simplicity of execution for the production of tones, combining the power of wind instruments and the harmonious, flowing qualities of stringed instruments.

The most important parts of the vocal organs are pointed out in Plate No. 1. The line A represents the outside covering of the lungs as it appears at rest.* The dotted line B represents the lungs in a state of exhaustion. The dotted line C represents the lungs full. D represents the muscles acting on the lungs to produce the power; E represents the muscular, elastic tissue which sustains the air cells and controls the power; F, the three bronchial tube branches which are the origin of the three

*See "Artistic Tone Production through Natural Breathing," Lesson and Exercise 3, page 36.

registers of the voice; G, the trachea or windpipe; H, the vocal cords; I, the false vocal cords; J, the glottis; K, the larynx; L, the resonance chamber; M, the ethmoid bone; N, the palate. O represents the tongue, which is not a part of the vocal organs but is so liable to interfere with the production of musical tones that it is well to instruct the pupil at the beginning that in the production of open tones, such as Ō, Ô, OO, AH, A, E, I, O, U, and Y, the tongue cannot render any assistance; it is even liable to impair the quality of the tones unless it is relaxed into its natural place. The tip should be near the base of the lower front teeth and its root or base flat in order that it may occupy the least possible room and leave the throat free and open.

QUESTIONS FOR TOPICAL REVIEW

With what part of the human anatomy must the student of the science of tone production be familiar?

Can it be studied without a general knowledge of the human anatomy? How?

Name the parts of the vocal organs which are pointed out on Plate No. 1.

Is the tongue a part of the vocal organs?

Why is the tongue especially called to the attention of the student at the beginning of the course?

CHAPTER II

Physiology and Psychology of the Vocal Organs

The physiology of the vocal organs will be extensively treated in the following chapters. Each anatomical part illustrated in Plate No. 1 will be separately considered, in order that its specific function may be understood. The pupil will be required to practice some special exercises by which the physiological condition of the individual parts will be trained and accorded with the other parts of the vocal organs.

The psychological study, the power of the mind over the vocal organs, should be considered by itself, and it is desirable to treat it first.

It is generally agreed that the mind has

some influence over matter. Some teachers go so far as to claim that remote objects may be influenced by the power of a person's mind. This is not generally accepted, but that our own mental power may assist our physical efforts no one can entertain doubt. No matter how much he may read on the subject, and no matter how many hours a day he may spend in vocal exercises, without the desire and determination to regain the natural use of the vocal organs a pupil would accomplish little. On the other hand, a pupil with the desire and determination to regain the natural voice will succeed even when but little time is given to it.

The intellect has to be exercised to be brought up to its normal development. An inferior mind is either incapable of dwelling for any length of time on one subject or forever returns to the same. An ordinary intel-

lect has usually some incoherent glimpses of ideas not related to the train of thought under consideration. The practice of entertaining two coherent trains of thought at the same time is an excellent mental exercise and it can be effectively practiced by any one of average intellect. The practical use of the science and the art of tone production may often be benefited by an intellectual possibility of entertaining three distinct trains of thought at once. Napoleon could dictate five letters at one time.

The power of the mind has probably more to do with the success of acquiring the science and the art of tone production than it has with anything else, because the voice is yet, at times, under the complete control of the subconscious in which is invested the mind power.

An intelligent struggle generates but little power of the mind until it is incor-

porated into the subconscious. It is then permanent, and it may be active even when the conscious mind is wholly involved in something else. It is in this way that sometimes, in cases of great moment, we do the best for the welfare of the Ego without any mental responsibility.

The following chapters will have to be intelligently studied. The exercises will have to be carefully practiced with some intellectual effort until the organs become automatic in their action.

QUESTIONS FOR TOPICAL REVIEW

How is the student in the science of tone production instructed in the physiology of the vocal organs?

When should the study of psychology by the student of the science of tone production begin?

Why does psychology especially concern the student of the science of tone production?

Enumerate different mental conditions.

How can the mentality be exercised?

In what part of the mind is the power which we call will or mind power?

With what part of the mind should vocal exercises be first practiced?

How can we ascertain that the various anatomical parts of the vocal organs have regained their natural functions?

CHAPTER III

The Power

As in everything in which there is action the production of vocal tones is accomplished at the expenditure of some energy. The power for the production of this energy is consequently the first requirement of an artist.

The power in vocal tone production, to be normal, must originate in the action of the muscles marked D in Plate No. 1. These muscles, by their contraction, cause the lungs to open and let in the air, and by their relaxation they become dead weight against the bronchial tubes and the air cells, so that the air previously taken in is forced out.

Unfortunately we do not, in our present civilization, ordinarily use our lungs enough.

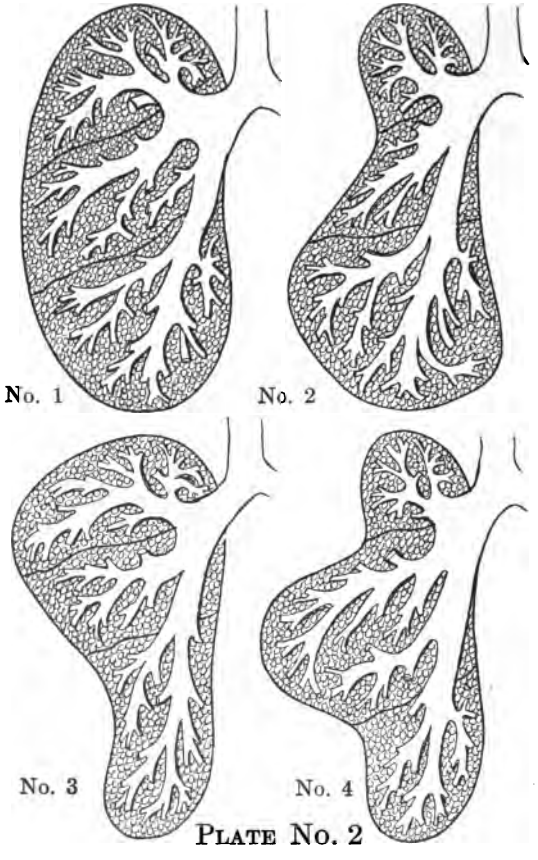


PLATE NO. 2

Original plate, showing the four types of lungs as found in practical anatomy

Most adults only partly use them. This accounts for the abnormal development of these organs. Some persons, while usually using their lungs, but faintly keep all the power-producing muscles in action all the time. The bronchial tubes and the air cells of the lungs, while weak, keep their normal proportions. A person having lungs in this condition has, to express it differently, retained the natural voice and only needs the proper exercises to strengthen and limber the power-producing muscles, and at the same time study for artistic achievements.

Some persons do not use some of their power-producing muscles, and the bronchial tubes and the air cells beneath become useless. This prevents a normal development of the lungs and is the primary cause of breaks in the voice.

We can classify the lungs into four types.

No. 1 type in Plate No. 2 is the normal lung. The types Nos. 2, 3, and 4 are abnormal. The possessors of such lungs have lost their natural voice, and the first step in regaining it is the restoration of the normal development and strength of the lungs by some simple breathing exercises. The most effective breathing exercise to begin with is what may be called The Exhaustion. It induces very deep respirations. A respiration is composed of an inhalation and an exhalation.

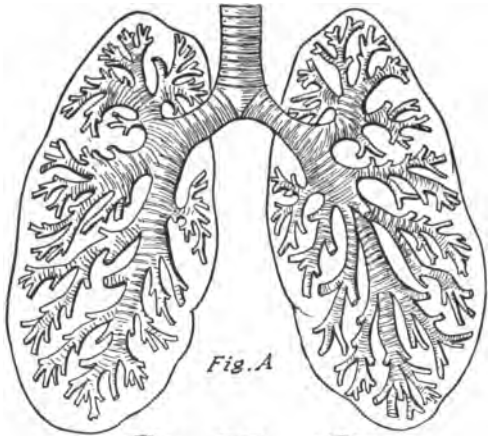
The exhaustion is obtained by ending a respiration with a sigh of contentment, and at the end of the sigh, when the exhalation seems to be completed, begin to count legato, one, two, three, four, etc., as far as you can, depressing and bearing down inwardly on the lungs, in this way forcing a continuous outflow of air, which is necessary for the action of count-

ing. When you can count no further the exhaustion is completed. Now let the air rush back into the lungs through the nostrils. This should be continued as long as possible without too much fatigue.

The exhaustion exercise has the effect of relaxing all the power-producing muscles, and thus the air cells and bronchial tubes, which are otherwise inactive, are brought back into natural action.

The activity of the whole lung brings on a desirable flexibility of the surrounding soft tissues and a motility of the bony frame without which the maximum voice power cannot be acquired, especially for the high tones, because the weight of the clavicular muscles is not sufficient to counterbalance the pressure exerted by the powerful diaphragm when it has attained its normal development.

The exhaustion exercise has also the effect



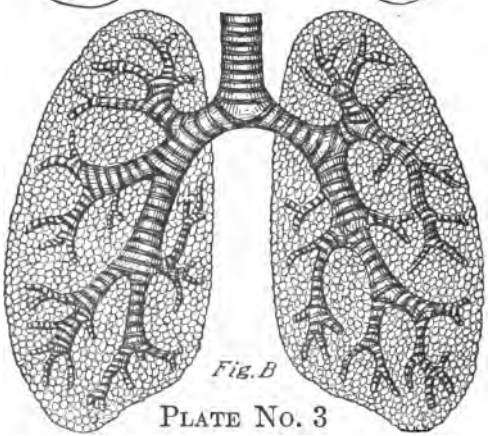


PLATE NO. 3

Original plate. Fig. A shows the lungs and the bronchial tubes. Fig. B shows the same parts with the air cells added

of lengthening the respiration, and this is a very desirable feature in the practical use of the art of tone production.

The second exercise of the lungs is called The Tension Exercise. It begins with a complete exhaustion, and as the lungs are filled by the following inhalation, holding in all the air, the two hands are placed flat against each other, about ten inches away from the chest, then a strong tension of the muscles of the lungs, chest, and arms is brought on. The muscular force should be put on as strongly on one side as on the other, but through the action of the will the hands are carried from front to side, from side to side, and up and down. These movements should be done with hands at various distances from the chest, and carried as far as possible in each direction and the tension strenuously sustained until exhalation becomes necessary. As this exercise is very

strenuous, very little clothing should be worn while it is being practiced. The most convenient times, therefore, for this exercise are just after rising and just before retiring; and if practiced ten minutes daily according to these suggestions much good will result. An additional two minutes at the same time in the bending exercise would be of great advantage to the general health, good poise, and grace of movements. This exercise consists of touching the floor with the hands while the feet and knees are held close and immovable, the bending taking place at the waist only. In the same way the thorax can be swayed from side to side and made to rotate against the diaphragm.

The third lung exercise is called The Systematic Respiration. This is done by mentally counting the steps that may be taken during a respiration, taking one-

third of a given number for each period of the respiration. In adopting the number 30 for the whole gymnastic, each period of

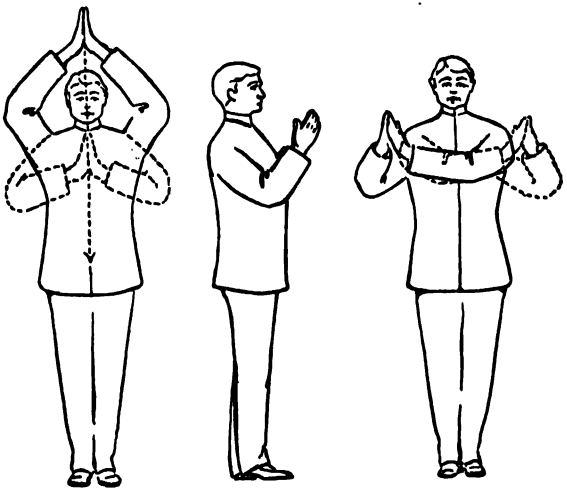


PLATE NO. 4

Original plate, illustrating various movements of the muscular tension exercise intended for the development and strengthening of the chest and lungs

the respiration should last the time necessary to count ten. Example: The pupil, while walking, mentally counts the steps

with the beginning of an inhalation, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; now the air is held while counting mentally 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; then the air is slowly let out while counting mentally 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. The number 30 for the whole gymnastic, 10 for each stage of the respiration, may be too great or too little, depending on the quickness of one's steps and the lung power of the pupil; it may be made more or less to suit each case. The important point to observe is that the number reaches the full capacity of the lungs and that the exercise be divided into three, in order that the respiration be divided into three equal parts. Care should be taken not to overdo it immediately after a full meal, for fear of causing too much strain upon the heart.

During the second stage of the respiration, while the air is held in, the pupil should

elevate the chest and force the air up by pounding it with closed fists. It is beneficial to obtain some complete exhaustions

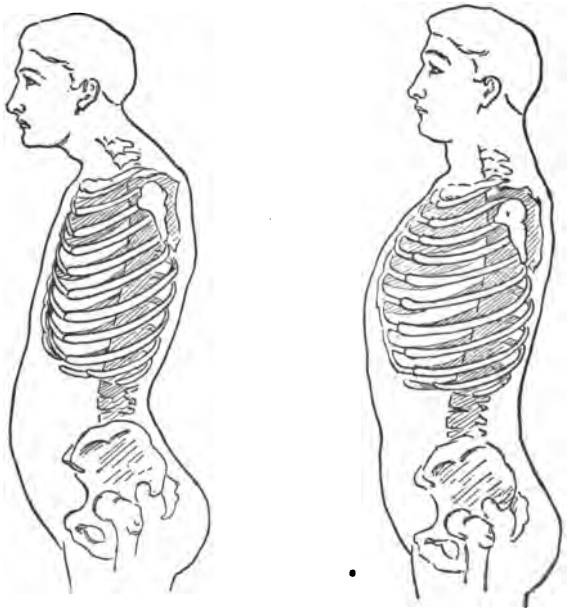


Fig. A *Fig. B*

PLATE NO. 5

Original plate, showing the human trunk, the ribs and their flexible ligaments, which permit the adaptation of the bony frame to accommodate the lungs

by counting aloud at various pitches of the voice, beginning with a sigh and counting as long as possible, marking each count by striking the key of the pitch on the piano.

The hanging of the head is caused by the falling in of the upper part of the lungs. The health and normal development of the lungs restore the symmetry of the trunk, and the head returns to its normal position without effort.

QUESTIONS FOR TOPICAL REVIEW

What is the first thing to be provided for the production of a vocal tone?

Where is the origin of the power?

What is the physical action by which the power is produced?

In Plate No. 2 which is the type of lung possessed by an adult who has retained the natural voice?

How can the normal condition and the strength

of the lungs be regained by adults possessing lungs of the types Nos. 2, 3, and 4 in Plate No. 2?

What is the first breathing exercise called?

How do you perform the exhaustion exercise?

How much should the exhaustion exercise be practiced?

What are the effects of the exhaustion exercise?

What is the second breathing exercise called?

Demonstrate the tension breathing exercise.

Why should full lung breathing exercises be avoided after hearty meals?

What is the third breathing exercise called?

Demonstrate the third breathing exercise.

Demonstrate the bending exercise.

Demonstrate how an exhaustion is obtained in counting at various pitches of the voice.

What effect have the health and normal lung development on the physique?

CHAPTER IV

The Control

The matter of next importance to the possession of power is the faculty of controlling it.

A waterfall of a size sufficient to produce power to be converted into electricity or to be used in any practical way has first to be controlled.

In the vocal organs the controlling power is incorporated in the muscular tissue surrounding the bronchial tubes and the air cells. This tissue is compressible and resilient. Its action is under the control of the conscious mind and its health and elasticity quickly respond to an intelligent training.

A good test of the control is obtained by intercepting both the inhalation and the exhalation five or six times with the throat

open. Mentally counting the interceptions may help the regularity and the execution of this exercise. Inhale through the

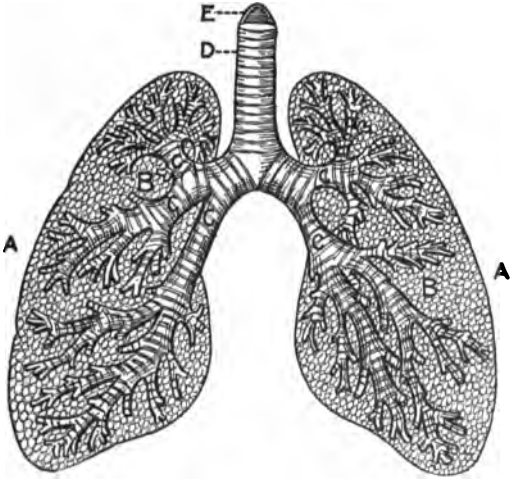


PLATE No. 6

Original plate. A, Outside of the lungs; B, Air cells; C, Bronchial tubes; D, Windpipe; E, Larynx

nostrils with the mouth open and exhale through the mouth, the throat being open all the time, so the interceptions must be caused by lung control. Panting is excel-

lent also. It is done by making short and quick respirations through the mouth with the throat relaxed and open, the tip of the tongue resting on the edge of the lower lip. It should be practiced with the lungs partly empty and at various degrees of fullness. With these different positions of the lungs in the necessary relaxed condition for a free panting, some vocal tones at various pitches are excellent tests of the control. It should not be practiced more than necessary, because inhaling through the mouth is undesirable.

The training of the control has already been started, for some of it is incidental with that of the power. It may have been recognized in the sensation which was experienced during the second period of the systematic respiration. The exhaustion, which has the development of the power for its special purpose, activates at the same time the compressibility and the

elasticity, which are the specific attributes of the control.

The control may be especially exercised by the practice of the catch breath exercise. The beginning of this exercise is the same as the exhaustion, but instead of making the exhaustion complete it is stopped a little before the end, and then a puff of air is quickly taken and the counting continued until the exhaustion is nearly completed, when a new catch breath may be taken and the exercise continued as long as may be desirable.

It is evident that the catch breath exercise is also beneficial to the power of the vocal organs, for while the catch breaths activate the compressibility and the elasticity of the control, a quick contraction and a perfect relaxation of the power-producing muscles are necessary for the proper execution of the exercise.

The special benefit of the catch breath exercise to the controlling force is in the effort made to hold back, with the internal muscular tissue, by efforts to keep the lung cavity opened and solid against the weight of the external muscles in such a way that no air escapes except for the purpose of carrying out the vibrations.

QUESTIONS FOR TOPICAL REVIEW

What matter is next in importance to the power in the art of tone production?

In which part of the vocal organs is incorporated the control of the voice?

What are the attributes of the muscular tissue which supports the bronchial tubes and the air cells?

How can you test the controlling power?

What is the exercise called which is especially intended for the development of the control?

Demonstrate the exercises by which the controlling power can be trained.

Is the catch breath exercise beneficial to the power?

What is required of the power-producing muscles for the proper execution of the catch breath exercise?

In what way is the catch breath exercise of special benefit to the controlling force?

CHAPTER V

The Adjustment

A tube is of no use with projectiles unless a good adjustment is secured. It matters not if the object to be projected is a bullet, a bean, or an air explosion wanted at a given distance or of a desired pitch; the adjustment is absolutely necessary to make the combination reliable.

In the production of vocal tones, the adjustment can be obtained in two ways: first, by the selection of a bronchial tube of the length and size to supply an air column of the necessary dimension to impel the required vibrations from the vocal cords for a desired pitch; secondly, by forcing out an air column regardless of its inner size, and constricting or distending, as the case may happen, at the upper end to get the

desired pitch. This is inartistic and physically harmful. It is the way most voices are destroyed. When naturally used the vocal organs retain their health, usefulness, and charm through life.

The student should now become acquainted with the adjustment by practicing the vocal exercise of Plate No. 7. These tones should be rendered staccato at first, attentively noting the changes that take

PLATE NO. 7

Original plate specially fitted for the adjustment of the vocal organs

place at the power end of the vocal organs for the different pitches. It may be helpful to begin the adjustment with the action of the power only, as practiced in the exhaustion exercise, and the breathy condi-

tion can then be corrected by the application of the controlling force. Adjustments require the simultaneous action of the intellect, to create a well-defined mental picture of the desired tone, and the power-producing part of the vocal organs. Each twig-like

PLATE No. 8

Original exercise for the practice of the adjustment

formation of the bronchial tubes with its surrounding air cells offers a possibility of shading the pitch of vocal tones. This is constantly proved by the unusual sounds often resorted to in clearing obstructed bronchia. An example is the smoker's cough. These organs should be intelligently exercised until they become automatic in their action.

The pupil may then practice the exercise given in Plate No. 8, beginning it staccato, and then the tones should be carried from one pitch to another, legato.

For this the vibrations of a tone are sus-

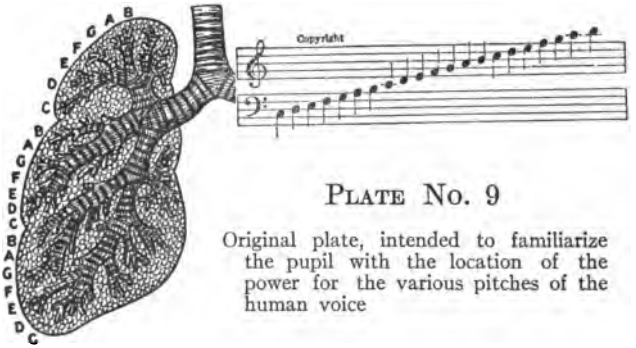


PLATE No. 9

Original plate, intended to familiarize the pupil with the location of the power for the various pitches of the human voice

tained until another adjustment is selected by which a different-sized air column is used and consequently a different effect on the vocal cords causes different vibrations. After the adjustments have been well secured on full tones the pupil should exercise for the half-tone adjustments on

such exercise as that given in Plate No. 20. It is sometimes advisable to wait until the pupil has acquired suppleness and a keen ear, which are necessary to make the half-tone adjustments perfect.

The natural voice is usually lost by taking an adjustment for a given tone and then pushing up from the same adjustment for a higher tone. Great care should be used at first to make sure that the natural action is restored. The vocal exercises should be done at first by exhausting the lungs, or with catch breaths, as in the breathing exercises.

The typical compass of the human voice is twenty-one tones divided into three groups or registers of seven tones each.

The student who has retained his natural voice may practice the exercises for the adjustment on an extensive range, perhaps two octaves or more, but those who have

defective lungs must have patience and devote some time to rebuilding their lungs by systematic breathing exercises.

All vocal exercises should be first practiced on open sounds, such as AH, A, E, I, O, U, and the object in mind should not be the extensiveness of the volume but rather the right action of the organs, to get at some easy results and pleasing effects.

QUESTIONS FOR TOPICAL REVIEW

What is the first requirement in the use of tubes and projectiles?

Have we more than one way of making the adjustment in the production of vocal tones?

What are the different ways of making the adjustment?

What are the physical effects of a throat adjustment?

How should the vocal exercises be sung at first in order to get the natural adjustment?

How are the different tone shades obtained?

How many of the attributes of the voice should now be in the tones?

What is meant by the qualification "legato"?

Demonstrate how two tones of different pitches are sung legato.

Explain the physical action by which a desired pitch is obtained.

What are the results of a constant training in the natural adjustment through the intellect?

What are the sounds on which vocal exercises should be made at first?

What is the typical compass of the human voice?

On what range of tones may a student who has retained his natural voice practice for voice adjustment?

What is the pupil with a short range to do?

What should be the main object in the student's mind while doing vocal exercises?

CHAPTER VI

The Registers

The human lung is divided into three lobes or ventricles. Each of these lobes is the origin of a register of the voice.

Each register of the voice has a tone peculiarity which is particularly well adapted for the rendering of specific emotions.

The inferior register contains the tones best suited to convey the feelings of rest, comfort, kindness, gratitude, and love. These are the effects of the heavy air columns which are supplied through the voluminous division of the lower bronchial tube called the inferior branch.

The middle register, through the middle branch of the bronchial tubes, contains the tones best suited to impress authority. This register should be used exclusively in

commanding. It is also the best suited for usual conversations.

From the superior register we have the high pitched tones of the voice, because they

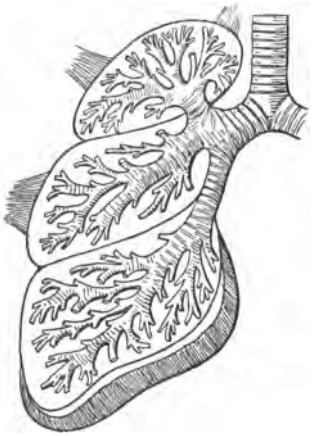


PLATE No. 10

Original plate, illustrating the three bronchial tube branches and their controlling muscles

originate from the small and short air columns supplied through the superior branch of the bronchial tubes. These tones

are especially well suited to express the feelings of pain, sorrow, and fear.

The illustration of Plate No. 10 is taken from the lung of the right side. The lung of the left side is to a small extent encroached upon by the heart and it differs a little in its outside appearance and also in its internal arrangement. This is plainly shown in the illustrations of plates Nos. 1, 3, and 6. This may be one of those wise provisions of Nature to fill in the weakness at the dividing lines of the registers so well defined in the left lung. A break in one's voice is through a weakness of the controlling force.

The illustrations in Plates Nos. 1 and 10 plainly show that the origin of each of the registers has its special and independent provision of power and controlling force.

Care should be taken that the normal action of all the registers be restored to

usefulness through some proper breathing exercises and suitable vocalisms.

Some persons have so lost the use of one, sometimes two of the registers, that they are skeptical about recovering that part of the voice which is lost. Except in some rare cases, where the air cells are atrophied, the natural functions of the organs are quickly regained.

The majority of adults breathe by the action of the diaphragm, which is the power-producing muscle of the inferior register. A pupil in this condition should cultivate chest breathing throughout the day, and especially during the breathing exercises. The chest should be held up and, while full of air, should be pounded with closed fists and massaged constantly until the power-producing muscles of the superior register are brought back into action. Its practical use for tone production may then be at-

tempted. It is sometimes best brought on by a high tone made in a short coughing way and sometimes by imitating the twitter of a bird, with the pronunciation of the letter E with a head resonance. An exhaustion almost completed on tones of a

PLATE No. 11

Original exercises for individual action of the registers

lower register and ended on a pitch that calls for the action of the superior register, may be helpful, as illustrated in B, Plate No. 11. By asking the pupil to sustain the low tone and merely make a mental picture of the high one as he gets to it, sometimes the teacher can, by a gentle pressure of the

hand and the thumb over the pupil's scapula and clavicle bones, effect a sufficient depression of the thorax to cause the desired action from the superior branch of the bronchial tubes for the production of an open and true-pitch tone from the high register. This demonstration is ideal when the low tone, which has been sustained, is changed into a harmonic at the appearance of the high tone. The pupil is then instructed as to how he can obtain the same physiological results by himself, depressing inwardly in the throat and lungs and at the same time permitting the collapse of the bony frame, as in a deep yawn, as he makes the mental picture of the tone and permits the concerted effects to take place in the head. The next important step is to make him realize that the inward depressing action and the collapse of the bony frame must be continuous and identical while scaling up or down.

The ill-trained and the beginners are inclined to mistake the effects for the cause.

If the action of the power is right, the volume increases fast, even though the tones are very weak at first.

A condition is frequently met which is the opposite of the one just considered. In families where, for several generations perhaps, the clothes have been worn tight at the waist, the habit of breathing wholly from the upper part of the chest has caused the air cells and the bronchial tubes of the inferior branch to degenerate. This condition is soon improved by freeing the waist, massaging the lower part of the chest, and adopting the habit of breathing through the action of the diaphragm. The same mental and physical efforts which were used in the restoration of the superior register are resorted to, but the action is inverted.

Very soon some tones with the sounds AH, A, OO, O can be produced through the action of the diaphragm, which is the power-producing muscle of the inferior register. Exercise C, Plate 11, may be helpful to such pupils.

The habit of wearing the clothes tight at the waist may have an effect different from that of the one just considered. It sometimes causes the inferior register to be forced down without losing its function. In such a case it is usually the middle register which is put out of action.

The same result may be the outcome of intentionally using low tones only. The treatment of this condition is similar to that of the preceding one, but it should be applied to the region of the intercostals, which are the power-producing muscles of the middle register. The claviculars are the power-producing muscles of the superior register.

The registers newly returned to usefulness should be constantly exercised through usual breathing and by vocalizing the exercises given in this volume, or any other vocalisms suited to the development and limbering of the voice.

By attention to his own feelings the pupil should note that the power-producing muscles and the internal muscular elastic tissue, in which the controlling force is incorporated, are counteracting in their principles.* The greater the tension of the internal tissues by efforts to keep the lung cavity opened, the heavier becomes the action of the power. They act automatically for the supply of air columns appropriate for the production of the power, softness, or whatever tone peculiarity the performer

*Manuel Garcia tried to illustrate this apparent incongruity of the vocal organs by telling his pupils that "the strangest thing about the voice is that when you think it is out it is in, and when you think it is in it is out."

may have in mind. This occurs through reflex action, or the action of the subconscious. It is sometimes illustrated in interjections uttered at the sensation of pain.

Sometimes a cold will aid in locating the registers of the voice. At first a cold is generally limited to one of the registers, but it usually passes from one register to another. We often hear people say that they can speak above or below their cold. This means that they use another register for the time being, since the cold is located in the tissues which compose the register from which they usually speak or sing.

The typical human lung is of a development necessary for the production of three groups of seven tones each, somewhat in the order suggested in the illustration of Plate No. 9. As all mechanical devices are but imitations of natural things, we

learn from our study of the vocal organs that all musical instruments and also written music are but imitations and illustrations of the ways in which the vocal organs are naturally used.

QUESTIONS FOR TOPICAL REVIEW

What are the divisions of the lungs called?

Of what special interest in the study of tone production are the three ventricles of the lungs?

What are the tone peculiarities of the three registers of the voice?

From which side of the body is the lung taken for the illustration of Plate No. 10?

What causes the dissimilarity of the two lungs? Is this dissimilarity of any importance in the study of tone production?

What condition would prevent the restoration of one of the registers of the voice?

Give some of the causes by which the registers of the voice may be lost.

Enumerate the ways by which the lost action of one of the registers of the voice can be regained.

What is the power-producing muscle of the inferior register called?

What is the name of the power-producing muscles of the middle register?

What is the name of the power-producing muscles of the superior register?

How should the register newly restored to usefulness be exercised?

What is the existing condition between the power and the controlling force of the vocal organs?

What is the physical effect of their action?

What are the phenomena that may be experienced with a cold?

What is the range of the typical human lungs?

What may we infer from the study of the vocal organs in regard to musical instruments and the writing of music?

CHAPTER VII

The Vocal Cords and the Harmonics

The air columns after their exit from the branches of the bronchial tubes have a common passageway, called the windpipe or trachea. (See G, Plate No. 1.) This tube-like part of the vocal organs, like the bronchial tubes, is lined with mucous membrane. It ends at the top with a slit-like opening, called the glottis. (See J, Plate No. 1.) A membrane, called the epiglottis, fits over it like the lid of a box and closes it during the act of swallowing, so as to protect the lungs from the food and liquid which are intended for the stomach.

The slit-like opening at the superior end of the trachea, the glottis, reminds one of the openings in the pipes of an organ. Im-

mediately below the glottis are the vocal cords, H, Plate No. 1, and the false vocal cords, I, Plate No. 1. They are parallel and, beginning at the larynx, K, Plate No. 1, extend back of the trachea on each side for about half to three-quarters of an inch.

The false vocal cords are so called because they have the appearance of the vocal cords but have none of their attributes. Their purpose may be the ready nutrition that the vocal cords can derive from the generous supply of blood vessels they contain.

These important parts of the vocal organs, the vocal cords, are not under the control of the conscious mind. As the eyes glitter from the effect of happiness, as the saliva comes to the mouth at the anticipation of something tasty, through reflex action, so at the thought of a tone the

vocal cords swell out to the extent of shutting off the exit, until the outward traveling air columns cause a blow or a friction impelling them to vibrate. The extent of the vibration of the vocal cords is determined by the intensity of the blow they receive. An air column resulting from the action of the inferior register causes a deep tremor of the vocal cords and this sends forth the long and slow sound waves which constitute low tones. An air column of the middle register causes a tremor of only half the depth in the vocal cords of that of the inferior register, so the sound waves are only half as long, but they are doubled in quantity. Consequently the pitch of these tones is one octave higher than that of the corresponding tones of the inferior register.

The air columns which are caused by the superior register affect the vocal cords only superficially, so the sound waves are again

reduced in length by half, but the number is again doubled, so that the pitch of these tones is still one octave higher than that of the corresponding tones of the middle register. This arrangement permits a simultaneous action of the three registers, each one having its individual effect on the vocal cords and the three kinds of sound waves being produced at the same time. This concentrated action of the registers and the results are most gratifying. It does not bring forth three disconcerted tones but rather that of one tone composed of a basic part and two harmonics or overtones. This is what constitutes the natural voice.

The meaning of the common expression "loss of the natural voice" is above all else the lack of harmonics in the tone one produces in singing or speaking. The harmonics give a coloring and a flowing quality to the tones such as could not be obtained from

one register alone. The harmonious quality of the voice is regained by an intelligent application of the natural action during the vocal exercises and by incorporating it into the speaking voice for constant use.

The student should be aware of the fact that the simultaneous action of the three registers increases the activity of the vocal cords to such an extent that an irritation, causing a burning sensation in the throat, might be felt after the exercises. This discomfort is a warning of Nature. The student should be prompt in recognizing it and yield to it by softening the quality of the tones and shortening the time of the exercises. The strength of the vocal cords gradually increases with a moderate amount of exercise. In some cases they seem to become indefatigable, but they are constructed with delicate tissues and it would not be reasonable to overtax them continuously.

QUESTIONS FOR TOPICAL REVIEW

What is the passage above the bronchial tubes called?

What is the lining of the windpipe and bronchial tubes called?

What is the upper opening of the windpipe called?

Name the membrane that closes the glottis.

What is the purpose of the epiglottis?

What are the false vocal cords?

Where are the vocal cords located?

What is the size of the vocal cords?

How are the vocal cords acted upon?

Describe the manner in which the vibrations of the vocal cords take place.

What are the particular effects of the registers' action on the vocal cords?

What is the result of a simultaneous action of the three registers in the production of a tone?

What is the loss of the harmonious quality of the voice commonly called?

How is the harmonious quality of the voice regained?

Why are the vocal cords liable to be irritated by a simultaneous action of the registers?

How should an irritation of the vocal cords be relieved?

CHAPTER VIII

Balance of Power

With the realization that the production of a harmonious tone requires the coöperation of the three registers of the voice, it is thereby concluded that the three air columns are accommodated at the same time through the windpipe (G, Plate No. 1), in the same way that three different and independent streams might run in a river bed. In taking away one of the registers, the windpipe remains still wholly occupied, but by only two air columns.

It is desirable that the pupil first become acquainted with the mechanism of two of the registers in the formation of a tone. For this, some training on the exercises illustrated in Plate No. 12 will be beneficial.

Experience will show that in the case of the majority of people the voice has retained a few tones of a natural quality to

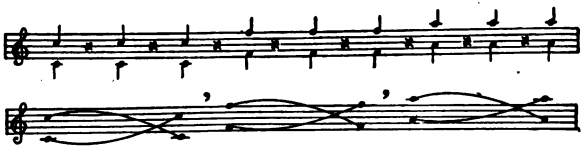


PLATE NO. 12

Original plate and exercises intended to practice the octave overtone and the changing of the basic and the harmonic relative position during the sustentation

the extent of having an overtone. As soon as the pupil becomes conscious of this condition in some tones of his own voice, with a few demonstrations he realizes the possibility of inverting, through the will power, the relative positions of the basic and the harmonic part of a tone, somewhat in the way the hands are carried from side to side in the tension exercise.

The whole power of the lung is applied

through a complete relaxation of the power-producing muscles and the thorax, and the tension is applied on the internal controlling force in such a way that the air columns of the registers are supplied at will with a volume sufficient to cause either the basic or the harmonic part of the tone.

An air column, of whatever register it may be, when intended to produce the basic part of a tone is of a greater volume than when it is intended to produce the harmonic part. This requires an up or down application of the controlling force for the alternative changes of the pitches of the tones.

The passing of the basic part of a tone from one register to another requires balance of power, because a graceful execution of this interchange of condition between the registers can take place only when the coöperating parts are of even strength and flexibility.

With the practice of the exercises for gaining balance of power the pupil should also become conscious that each register brings its particular qualities to the tone with which it coöperates. The high tones are softened by the deep coloring of the

PLATE No. 13

Original plate. This exercise is very good for blending the qualities of the three registers into one another

low harmonics, and the low tones are made more flowing and brilliant by the high overtones.

As soon as the pupil has acquired a good understanding and a fair execution of the exercise given in Plate No. 12 he will find the exercise in Plate No. 13 a valuable help for blending the qualities of the voice in passing from one register to another.

This exercise, like all the others, should be practiced with the production of tones, slowly at first, and gradually increasing the time as strength, limberness, and confidence are gained. The tones should be made soft and harmonious, rather than voluminous and brilliant. In reading and for usual conversation, as in singing lullabies and love songs, the tones are more appropriate and the voice is made more melodious by taking away the characteristic peculiarities of the registers. Such tones are composed of three harmonic parts instead of a basic and two harmonic parts. This condition is usually referred to as "mezzo voce" in musical terms.* The changes in the pitch of the tones, the causes and effects become less material and the psychological object for which the voice is used is more easily

*See "Artistic Tone Production through Natural Breathing," page 142.

obtained. It is best to use the voice in this way, except when for a special purpose the particular peculiarity of a register is desired; but it could not be practically used until the vocal organs have attained a normal development and the voice has been well placed and securely balanced; yet, efforts in that direction may be occasionally attempted from the beginning.

The breathing exercises should be constantly practiced, and the pupil should keep in mind that the success of the present depends on the constant use of that which has been acquired through the practice of previous exercises.

QUESTIONS FOR TOPICAL REVIEW

What is required for the production of a harmonious tone?

How can the air columns of the three registers reach the vocal cords at the same time?

Is one-third of the trachea left empty by removing the action of one of the registers?

Is it possible to produce a tone composed of only two of the registers?

Which tones in a pupil's voice are the most appropriate to begin the practical harmonization of the registers?

How do you get the interchange of pitch between the basic and harmonic parts of a tone?

What physical change in an air column of a register accompanies the change from the production of the basic part of a tone to the production of the harmonic part?

Produce a tone of the pitch of middle C on the piano, having an overtone one octave above or below.*

Why is balance of power necessary for an interchange of action between the basic and the harmonic parts of a tone?

How is the quality of a tone affected by having the coöperation of the three registers for its production?

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*The teacher may decide which of these happens to be the more appropriate change for the case in hand.

How long should vocal exercises be practiced?

What quality of tone should be sought at the beginning?

What is the peculiarity of the voice called "mezzo voce"?

Demonstrate how the basic characteristic is removed from a tone. How does this affect the voice?

Upon what is the success of the present and the gradual building of the voice dependent?

CHAPTER IX

Timbre

It is an amazing fact that of all things created and manufactured no two are the same. The "two peas in a pod," when subjected to a powerful microscope, become as different as two hills seen across a valley.

The timbre of the voice is a distinguishing characteristic of a person. A made-up voice does not ring true. Like an artificial complexion, it might appeal at first, but it does not charm. It rather invites ridicule, and it is the first provision a clown makes. The individual qualities can be cultivated to better advantage. The teacher should be careful to discourage any inclination a pupil may have to imitate. Some demonstrations as to the application of power and the results are often helpful,

but the pupil should appropriate the mode of action without losing his individuality.

The timbre of the voice depends mostly on an individual peculiar arrangement of the basic part of a tone and its sustaining harmonics. The most apparent differences in voice timbres are caused by the closed and dispersed harmonics, which are naturally selected. When the selection is natural, the harmonics are never the same in two individuals.

The production of the octave harmonic, as illustrated in Plate No. 12, should be practiced only as much as may be necessary to make the pupil realize how the acting power of the registers can coöperate and be interchanged in their relative part in rendering a harmonious tone. With this understanding, the pupil should apply the action of the three registers at the same time, but without a conscious selection of

the harmonics, so that the natural selection may be made through the subconscious, by reflex action. These tones will be of the characteristic voice timbre of the individual.

The exercises of Plate No. 7 may be used at first, and later the exercises of Plate No. 14, for the production of harmonious tones with the natural timbre of the pupil's voice.

QUESTIONS FOR TOPICAL REVIEW

How should the voice be cultivated?

Against what should a pupil be guarded when receiving demonstrations?

What constitutes the timbre of the voice?

What is the cause of great differences in voice timbre?

What is peculiar in the natural selection of the harmonics?

What is the principal object in the practice of rendering the octave harmonic?

How is the natural timbre of the voice realized in harmonizing a tone?

CHAPTER X

Falsetto

Most people who have lost the natural voice occasionally produce some inharmonious high tones, called falsetto, because they lack the natural sustaining harmonics.

Falsetto tones are produced in two ways: First, the tone is produced by the right application of the power and the controlling force of the superior register without the coöperation of the inferior registers for the production of the natural harmonics. A pupil in this condition should exercise on scaling down his falsetto tones into the middle register. Part B of the exercise in Plate No. 11 is helpful at first, and Part A after the harmonization has taken place.

Secondly, some falsetto tones are produced without the desired application of the power

of the superior register but through the application of the power of the lower registers, in such a way that through the crowding of the superior lobe of the lungs an air column is emitted from the superior branch of the bronchial tubes without the action of the clavicular muscles, the power-producing muscles of the superior register. No benefit can be derived from this way of producing falsetto tones. It should be discouraged altogether.

The alto tones of men and the so-called "covered tones" are produced in the same way, but through the simple action of the diaphragm on the middle and superior registers, so that the tones have a basic and harmonic part without the action of the power-producing muscles of these registers. Tones so produced lack in volume, yet they may appear interesting although having a muffled sound. They are inartis-

tic and should not be encouraged under any circumstances. A pupil with the habit of producing tones in this way must practice more on the simple breathing exercises, in order to get the natural strength and suppleness of the power-producing muscles of the middle and superior registers. This should be done until they return to their normal action.

QUESTIONS FOR TOPICAL REVIEW

What is a falsetto tone?

How are falsetto tones produced?

How can a falsetto tone become harmonious?

How is the power applied in the production of falsetto tones that cannot be harmonized?

What is the name of the power-producing muscles of the superior register?

How do men produce alto tones?

How is power applied for the production of "covered tones"?

By what exercises are the alto tones made by men and the so-called "covered tones" best corrected?

CHAPTER XI

Sounding Board

Mechanical devices are but imitations of natural productions; as musical stringed instruments require a sounding board, so the vocal organs, which include a part that vibrates, imply that there must be a part corresponding to the sounding board of musical stringed instruments. The ethmoid bone, see Plate No. 1, articulating with fifteen other bones of the head, several of them having large sinus, bridges over the face. This is the part of the vocal organs which is imitated in the sounding board of musical stringed instruments.

We realize at a glance from the illustration of Plate No. 1 that the air columns, carrying the vibrations impelled into them by their exit through the vibrating

vocal cords, necessarily continue their upward course until they meet an insurmountable obstruction.

The ethmoid bone, being in direct line above their exit, interrupts their course in such a way that they are disintegrated and the air molecules of which they are composed become free.

Many people, by continuously focusing the resonance of their tones into the mouth, form the habit of pressing the soft palate against the posterior wall of the throat in speaking or singing and so lose the use of this part of the vocal organs.

This way of producing vocal tones is very fatiguing. As the object of the sounding board of the musical instrument is to increase the effect of the vibrating strings, so the natural ending of the air columns against the ethmoid bone increases, many times, the effect of the vibrating vocal cords.

If lost, the natural condition must be restored, no matter how tedious the process may be. The soft palate must be relaxed so that the air columns are permitted to pass back of it. The production of nasal sounding tones, by letting some of the air escape through the nostrils, may be helpful. The sound of the vowel E at a high pitch and with much twang is usually helpful. Humming is effective and most beneficial to the quality of the tones. It should be practiced every day, beginning with the lips closed and the throat open and gradually opening the mouth, while retaining the harmonica effects.

QUESTIONS FOR TOPICAL REVIEW

Name a part found in all musical stringed instruments.

What is that part of the vocal organs called which corresponds to the sounding board in musical stringed instruments?

Where is the ethmoid bone located?

With how many bones does the ethmoid bone articulate?

What is the direction of the air columns as they pass out of the vocal cords?

How is the upward course of the air columns interrupted?

What takes place with the interruption of the air columns against the ethmoid bone?

How can the natural ending of the air columns be lost?

How can one regain the normal use of the ethmoid bone?

What effect has the use of the ethmoid bone on tone production?

Which vowel is usually used to best advantage in regaining the use of the ethmoid bone?

Demonstrate how humming should be done.

CHAPTER XII

Resonance Chamber

The large cavity, L, in Plate No. 1, which is located between the soft palate and the posterior wall of the throat, above the glottis and under the ethmoid bone, is called the resonance chamber. It is so named in all the text-books on human anatomy, and, with an understanding of the art of tone production, it becomes evident that Nature has intended it to resound the tones for the purpose of increasing their effect and at the same time improving their quality.

The resonance chamber is usually improved by opening the mouth with a backward-dropping action of the inferior maxillary and at the same time relaxing the soft palate and the throat. The larynx (the

Adam's apple) should then easily drop in its notch in the collar bone as in yawning. The size, which is a desirable feature of the resonance chamber, is thereby considerably increased. The dropping of the inferior maxillary has also the effect of ranging the tonsils at the entrance of the esophagus so that the upward passage of the air columns at their exit from the glottis is even and smooth.

As the disintegration of the air columns takes place with the shock they receive by the obstruction of the ethmoid bone, the air molecules, in which the musical vibrations are incorporated, tumble in a musical mass; the original vibrations of the three registers are thus admirably blended by being echoed; the identical peculiarities of the registers are eliminated, and the mass of harmonious vibrations of which the voice is composed becomes a musical stream, passing into and out of the mouth where it

can be utilized for the production of any desired sounds.

The intricate action of the various parts of the vocal organs being now automatically executed it becomes a unit at the disposal of the mind. This complete process is called *the natural voice.*

In speaking or singing, the performer has a feeling as if the head, the resonance chamber, the relaxed throat, and the lungs had become but one great broad and deep vacuum from which the tones are supplied with ease and at will without any apparent physical exertion. The important point then is to maintain the high resonance in this cavity in the production of low tones and the low resonance in the production of high tones. The larger the cavity, the bigger and the more resonant are the tones.

The exercise of Plate No. 7 should now be used with the sounds *ding* and *dong*,

having in mind the imitation of the ring of a bell, so that the basic part of the tone is heard first, but almost instantly joined and soon after superseded by the harmonics, on which the tone vanishes. These tones

PLATE No. 14

Original exercises to be practiced at various pitches of the voice for artistic development of the individual timbre and practical use of the resonance chamber

will be perfect when they have the effect of an echoed ring of a bell.

It is expedient to produce the tones staccato at first, a catch breath being taken between the tones with a decisive attack

and a precise adjustment. In singing two or more tones legato of the same pitch there is only one adjustment, but a new attack and a new adjustment are made without inhaling when a change of pitch is desired. The vibrations can be sustained and at will held in the resonance chamber or permitted to pass out through the oral cavity, where they can be used for the articulation of sounds.

The exercises given in Plates Nos. 7, 8, and 14, on the open sound of the vowels, should now be practiced with the ringing and echo effects. Most of the exercises should be practiced in tones of a soft quality, but it is beneficial occasionally to try the voice with the full power of the lungs. The depth of the catch breaths may be gradually increased until they constitute full inhalations if it does not hinder the relaxation of the power-producing muscles.

The full respirations materially increase the power and facilitate the execution of longer phrases. This is very desirable in the practical use of the voice. In using full respirations, the diaphragm is thrown outward and downward as the chest is inflated by the inhalation; the diaphragm is then pinched in, the power muscles of the superior register relaxed, and the bony frame left to a complete collapse, all at once. This maximum power of the vocal organs can then be, at will, dispensed through the controlling force. All increases in the volume of tones should be attempted by efforts to enlarge the resonance chamber and the lung cavity with a free use of the sounding board.

QUESTIONS FOR TOPICAL REVIEW

Where is the resonance chamber located?

For what use is the resonance chamber intended?

How can the size of the resonance chamber be improved?

What takes place when the air columns strike the ethmoid bone?

What takes place with the disintegration of the air columns?

What is commonly called the natural voice?

How is the ring of a bell imitated?

Demonstrate how the ring of a bell is imitated with the voice.

What is meant by singing "staccato"?

What is meant by singing "legato"?

How is the execution of long phrases facilitated in the practical use of the voice?

How is the full respiration used in tone production?

How are the tones increased in volume and resonance?

CHAPTER XIII

The Voice

As with all our other faculties, the voice is at its best when used without thinking of its complexity, and especially without having the mind on any of its component parts, although there should always be a mental alertness for the observation of at least three points, namely, the physiological cause, the physiological effects, and the psychological object. Time should be devoted every day to its technique, and this should be especially applied to the defective parts; for with the voice as with all physical achievements, the paramount consideration is the normal condition of all the component parts.

The strength of a chain is no greater than its weakest link. The weak tones of

the voice are the cause of most failures, and by them many artists are brought to premature end. The weak tones can be strengthened and they should be cultivated until they become equal to the best part of the voice. This can always be accomplished through appropriate breathing exercises, an intelligent application of the

PLATE No. 15

Original plate. These vocal exercises, practiced at various parts of the compass, are especially well adapted to equalize the tones

method by which their natural action is restored, by using them freely while speaking as well as in singing, and by constantly using, during the act of breathing, the part of the lungs from which they originate.

The exercises in Plate No. 15 are especially desirable when the weak part of the

voice is situated between the middle and the superior registers, as happens very frequently. The pitch may be varied half

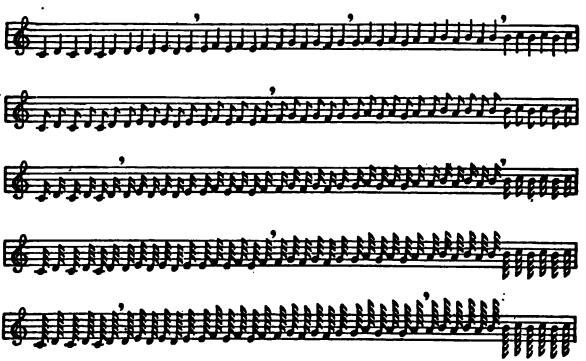

PLATE No. 16

Original plate. Exercises for the limberness and control of the voice

a tone at a time to two or three tones, higher or lower, and back in the same way.

The object of the exercises in Plate No. 16 is the quick adjustment and limbering of the controlling force. The whole power being applied through a complete relaxa-

tion of the power-producing muscles and the thorax, the voice is made to trill by a quick change of the adjustment. This is made easy by the oscillation obtained through the limberness of the controlling force. The exercises should be started with great precision in the attacks and at a definite pitch.

With practice the speed may then be increased as strength and flexibility of the organs are acquired, without reducing the size of the resonance chamber. Each attack should be made precise, and the change of adjustment with an open throat, as practiced in the exercises for controlling the power, may be accomplished without in any way impairing the quality of the modulations. This will be helped by imitating the sound of a bell with the pronunciation of the words *ding* and *dong*, and, on the soft vibrations of these sounds as they end, adding the sound of the vowels

in trilling without changing the place of the resonance which is necessary for imitating the vanishing vibrations in the sound of a bell.

While it is true that strength and flexibility of the muscles are gained by exercise, it is equally true that the nervous system and the muscular force, like everything else, can be ruined by too much exercise. Reason and common sense must be used. Fatigue is Nature's way of warning us. When it comes we should comply with her wishes by taking sufficient rest.

QUESTIONS FOR TOPICAL REVIEW

When is the voice at its best?

What should be the mental condition with respect to the practical use of the voice? Name three points of special importance in the practical use of the voice.

What is the paramount consideration in the development of the voice?

What are the usual results of having some weak tones in the voice?

How can the weak tones of the voice be made equal to the others?

How should you begin the exercises in trilling?

When should you increase the time in practicing the trilling exercises?

Against what should you be guarded in increasing the time in trilling?

How do you imitate the sound of a bell in trilling?

What is fatigue?

CHAPTER XIV

Speaking

Nature intended the tongue, the teeth, and the lips for a special purpose in the welfare of the Ego. As far as the musical quality of the tones is concerned, they are undesirable; but, as they are otherwise necessary, Nature could not remove them, so man has ingeniously utilized them for the articulation of his musical tones.

Since, in civilized nations, the voice is used mostly for the purpose of uttering words, the tongue, the teeth, and the lips are to some extent considered as parts of the vocal organs. As such, they are called the articulating organs, and it becomes pertinent to have them trained for the clearest possible articulation of the sounds

with the least possible interference in the musical quality of the tones.

The articulating organs, too, must be drilled and trained until they act automatically. The drilling exercises of the physical organs, consciously gone through, again and again, have, we know, the beneficial effect of limbering and strengthening the exercised parts, but more important than strength and suppleness is the enlivening of the subconscious mind, on which the artist depends for quick execution.

The pronunciation of all the vowels is accomplished by a slight change in the funnel-shaped opening of the mouth and lips. Plate No. 17, Figs. A and B, illustrates a front and a profile view of the changes.

In distending the lips and the cheeks for the necessary changes, care should be taken not to contract the soft palate, and the

tongue must remain motionless. The broad A, pronounced AH, is obtained by a broad but funnel shape of the lips.

O requires that the funnel be a little smaller but longer.

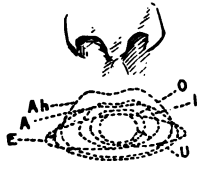

Fig. A

Fig. B

PLATE NO. 17

Original plate, showing in Fig. A the front view and in Fig. B the profile view of the changes in the funnel shape which the lips assume in the articulation of the vowels

For the pronunciation of E the mouth should be but slightly opened, but all the way from corner to corner, with the lips held near the teeth. A is pronounced by an adjustment of the lips about halfway between that which is required for the pronunciation of AH and that of E. The pronunciation of I is started on the same

adjustment, but slightly closer and immediately opening a little more.

The sound of the consonants B and P is obtained by a quick action of the lips on each other at the start of the enunciation. M is the opposite movement of the lips. C, D, N, T, and Z are pronounced by a slight touch of the tip of the tongue against the edge of the upper teeth.

F, G, H, J, K, Q, R, S, and V are pronounced by bringing the lower lip near the edge of the upper teeth, or by a simple movement of the inferior jaw. Some of these are hard to pronounce distinctly without moving the root of the tongue; but, with good training and intellectual effort to get a mental picture of the tones and the articulation of the words to take place in the resonance chamber, a distinct enunciation is obtained with very little commotion at the oral cavity.

The English TH necessitates bringing the lower lip near the edge of the upper teeth and pushing it out with the tip of the tongue. The syllables and words necessitate quick succession of these movements of the articulating organs. Example: The sound of the syllable AB requires the funnel shape of the lips, like the broad A, and instantly touching the two lips for the enunciation of the B. The syllable BA necessitates the same movements in the reversed order; and so on for all the syllables and all words composed of various letters necessitating compound articulation.

Plate No. 18 presents a list of letters, syllables, and words for the purpose of drilling the articulating organs. It is desirable that some of the exercises be executed with a mirror in front of the pupil, while moving the cheeks and the lips with rapidity. In all the motions

necessary for quick and distinct enunciation notice should be taken that the articulating organs can be moved independently of the true vocal organs, and it is useless to attempt the production of vocal tones without the coöperation of the vocal organs.

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, x, y, z, ab, ac, ad, af, ag, ah, al, am, an, ap, arc, abel, action, ba, be, bi, bo, bu, by, bah, bramas, brother, da, de, di, do, du, dy, dah, doll, dollar, fa, fe, fi, fo, foe, factotum, family, father, frank, gam, gander, garden, la, le, li, lo, lu, lah, less, light, lighthouse, ma, me, mi, mo, mu, my, mah, mamman, mother, monitor, member, na, ne, ni, no, nu, ny, never, ob, op, object, pa, po, pu, papa, pall, patriot, ra, re, ri, ro, ru, ry, rah, rather, ta, te, ti, to, tu, table, total.

PLATE No. 18

Original plate, presenting a list of letters, syllables, and words on which the articulating organs should be drilled

It is through such futile efforts that stuttering takes place. It is easily corrected through the proper training of the vocal organs and then using the harmonious

tones as they pass through the articulating organs for whatever sound may be desired.

The exercises should begin on the easiest vowel made by the pupil and pass on to the next hardest, and so on until the sounds of all the vowels can be articulated without any apparent physical exertion.

In practicing a composition to recite or to sing, it should first be committed to memory, then make the musical phrases on the sound of all the vowels and finally make the articulation of the words.

The respirations should usually be made through the nostrils, and it is desirable to make the inhalations in the same way during the exercises, but for the practical use of the voice in singing and in speaking the inhalations have to be made partly through the mouth.

A mental picture of a sound, a word, perhaps a whole phrase, should always be made before any physical action is at-

tempted. This is not peculiar to tone production. It is the way we achieve all physical feats. The picture of the necessary muscular efforts and the desired effects are in the mind before we undertake the leap of a brook. The voice, more than any other physical action, depends on this mental picture, because it is through it, and by reflex action and the power of the mind, that the vocal cords assume the desired position to be acted upon by the air columns. Unless the mental picture be made precise by intelligently performed physical exercises the jumper will some time fall in the brook and the orator and the singer will occasionally deliver sharp or flat tones. The positive pitch and the ability to read at sight are soon acquired with the precise action of the subconscious which is usually secured by intelligently performed vocal exercises.

The science and the art of tone production are also helpful to the student of languages, as the enunciation is facilitated by a well-trained sense of hearing. They are also the best means for correcting stammering.

We have but one voice. The musical quality of our tones should be kept at its best while speaking, the same as in singing.

While it is true that a greater range of tones is generally used for singing musical compositions than for speaking, there is no restriction applied to our way of speaking, and, as a general rule, our diction would be improved, our speech would be more interesting, if a greater variety of tones were used in speaking. Some say that tones are more sustained in singing. Not necessarily. The distinction between singing, reading, and speaking when a

phrase is monotonously recited is wholly psychological.

A pupil of average intellect who has the desired action of the power-producing muscles and the controlling force, a good adjustment and perfect balance, may be coached on the interpretation of the authors, even when the whole range of the voice is not uniform in strength. This can be remedied by working on compositions demanding a constant return to action of the weak parts of the vocal organs for the basic part of the tones. The time is thus used to double advantage.

QUESTIONS FOR TOPICAL REVIEW

What are the articulating organs?

For what object should the articulating organs be trained?

Demonstrate the changes which take place in the opening of the mouth for the pronunciation of the vowels.

Demonstrate some compound articulations.

What causes stuttering?

How can the impediment of stuttering be corrected?

How should you begin the exercises on the sounds of the vowels?

How should you prepare a composition to recite or to sing?

How should the inhalations be taken?

What is the psychological coöperation in the production of a tone?

Why is a mental picture of a tone necessary for good execution?

Is the science and the art of tone production of any help to the student of languages? How?

What is the difference between the singing and the speaking voice?

When is the study for the interpretation of the authors to begin?

In what way should a pupil begin to use his voice when the strength of the whole range is not uniform?

CHAPTER XV

The Teacher

One of the most gratifying and hopeful signs that our present intellectual progress is permanent is a tendency among parents and teachers to adopt the ways in which Nature intended the intellectual growth of the young to take place.

All through the animal kingdom the young is patiently and tenderly cared for and plentifully provided for until it is able to provide for itself. In this mankind has immeasurably degenerated.

As we go through the streets of a city where the poor are gathered, we find numberless evidences of neglected babies, sometimes intentionally illtreated. Even with the well-to-do and supposedly more intelligent classes, children suffer greatly through

mental and physical restraint. Often erratic parents, seeking relief from the tension of their restless nerves, abuse their children or by the gratification of their passions they jeopardize their happiness and good name.

We may be comforted with the realization that such theories as "Use the rod and save the child" and "Children may be seen but not heard" are now advanced only in humorous parlance.

The child is right because he is just out of Nature's hands, and she makes everything as nearly right as possible with the material she has at her command; she further helps in improving whatever shortcomings there may be if the child is given appropriate surroundings.

The intellect of the parents should be as a soft, mellow light to make the path which leads to their child's intellectual development attractive rather than painful by the

dazzling and bewildering searchlight effects. His efforts are most effective and success is fairly assured when a child is happy and does a thing because he wants to. The normal child is curious. Nature intended that this peculiarity in children should be a means to facilitate the acquisition of knowledge. Understanding this, the teacher can make learning expedient and pleasurable.

A teacher is intended to take the place of or to share the responsibility of the parents. He should have a feeling of love and good fellowship and, through these, analyze the wants of the pupil and devise means of supplying them by inciting the pupil to use his interest and apply his activities toward his own betterment. These are the natural requisites of a successful and desirable teacher.

It goes without saying that a teacher is expected to be especially well informed in

whatever branch of knowledge he is to impart. One could not be relied upon for the teaching of the art of tone production unless he possessed the science. As no two pupils could be found in need of just the same treatment, it requires a precise diagnosis and an intelligent application of the remedy to assure the desired results.

As a general rule, in teaching the science and the art of tone production it is advisable to rush through the course as fast as the pupil can acquire a good understanding of the physiological action of the vocal organs. In this way whatever good there may be in the voice can be preserved and used to good advantage; and the course may then be gone over again with the application of all the principles, perhaps using part of the time in coaching on a composition suited to the need of the pupil. It makes the study more interesting and fully as beneficial.

With pupils too young to use a text-book, even with children of the lower grades, the teacher will benefit the physical development and guard the natural voice by the use of the exhaustion and catch breath exercises by counting, or scaling a few tones up and down, by reading and singing in the same way. These exercises can be made interesting and successfully used with a class. Very soon the children unconsciously adopt the same way of using the lungs in speaking and for simple breathing.

The teacher of the art of tone production should have at heart and constantly keep in mind the physical as well as the artistic welfare of his pupils. Only a small percentage of them can attain the rank of great singers or powerful orators, a few will become competent to teach the science and the art of tone production, but every one can improve his health, his physical

appearance, and acquire an intelligent appreciation of the vocal achievements of others.

Such persons can consequently increase their pleasures by the knowledge of the science of tone production, and whatever improvement they can accomplish in this art with their own voices will be a material help towards their social or professional success, and an immense gratification whenever they may have occasion to address their fellowmen.

QUESTIONS FOR TOPICAL REVIEW

What is the general tendency of the time towards children?

What is the mental peculiarity of a normal child?

What is a real teacher?

How are the best results obtained in teaching?

What are the requisites of a teacher in the art of tone production?

What purposes should a teacher have in view for his pupil in imparting the science and the art of tone production?

CHAPTER XVI

The Pupil

In the study of the science and the art of tone production the word "pupil" designates an adult or one who has at least reached adolescence, the age when a person has become self-dependent or is preparing to be.

The pupil comes to the teacher of his own volition. His interest in the study is all that could be desired; in fact, the teacher is often obliged to restrain his excessive ambition for advancement. The simple breathing exercises, which are many times the only reliable means of laying the foundations on which the voice is built, hardly suffice to satisfy his impetuosity.

He is sometimes inclined to accept the

theory, "The way to learn to sing is to sing," quoted by incompetent teachers, who begin teaching by the interpretation of authors with all their pupils.

Most singers and vaudeville actors, when they are forced to leave the stage, become teachers of vocal music or elocution. By acquiring the science of tone production many of them might make desirable teachers, but they shirk the necessary exertion, relying on the fact that to most people the possession of a pleasing voice is a sufficient guaranty of ability to teach, and most pupils are attracted by the method of quick singing by imitation. Man has not yet abandoned his pursuit of the fruit of omniscience and the magic rod. The medical profession, after several generations of faithful study and intelligent teaching, has not materially reduced the prosperity of the charlatans. The promise that health can be bought in

a bottle sounds good to the sick. Millions of dollars are lost every year on the get-rich-quick promise. Thousands of pupils ruin their voices and impair their health at the hands of incompetent teachers.

To succeed in the study of the science and the art of tone production, the pupil needs energy and brains and he must use these faithfully in following intelligent teaching which accords with the laws of Nature.

The principal object of the lessons is to enable the pupil to apply his energy to the best advantage when by himself.

The quality of the teacher's voice has no importance further than the ability to give clear demonstrations of the physical action of the vocal organs. The sex of the teacher is immaterial for the success of either sex. The question of fitness is rather in the aptitude of a person to locate the

weak parts and apply the needed exercise, or detect a partial tension and direct the means for a necessary relaxation. This is for the building up of the organs and the acquiring of the art of tone production. The study of vocal music and the interpretation of the authors require the selection of a person having all the aptitude needed to teach the art in order that it may be guarded; but a more advanced knowledge of music and the ability to perform gracefully might be of material assistance.

The pupil can be benefited by hearing good artists of his profession. He should not try to imitate them, no matter how much superior they may be, but he cannot help being prompted by a salutary ambition, and he always receives some practical suggestions for the natural advancement of his own voice.

QUESTIONS FOR TOPICAL REVIEW

At what age should the study of the science of tone production be commenced?

What must a teacher be guarded against with many pupils?

What method of singing attracts many pupils?

What are the requisites for a pupil's success in the study of the science and the art of tone production?

What is the principal object of the lessons?

Of what importance is the quality of the teacher's voice?

Should the sex be considered in the selection of a teacher? Why?

What should be the special aptitude of a person selected as a teacher of tone production?

Should a person have the same requisites to teach vocal music and the interpretation of the authors as to teach the science of tone production? Why?

How is a pupil benefited by hearing artists of his own profession?

CHAPTER XVII

The Child's Voice

One of the misfortunes in our present civilization is the loss which comes because mothers have so little leisure during the babyhood of their children. Many have not even the time to realize the natural bliss of motherhood. The modulations of a baby's *goo, goo,* the delicacy in the coloring, the true pitch and fullness of tones which are at the same time soft and of the most melodious quality, are sublime. This happy condition of the voice remains with the child growing under natural conditions. Monotony in children's voices can always be traced to undesirable surroundings. A child growing out-of-doors, playing with other children, is always a perfect natural artist in tone production.

The child's voice is of a high pitch, of the lyric soprano quality, because the development of his lungs is incomplete and it is a physical impossibility for a child to produce harmonious low tones. The shrill quality is caused by the lack of low harmonics. Hushing a child or coaxing him to make low tones destroys the quality of his natural voice and physically injures his vocal organs by distending the throat to get a low pitch quality with the action of the power-producing muscles of the superior register.

The mother's baby talk, characteristic of childhood, may be considered a wise provision of Nature; and it would be very desirable, for the first grades at least, to choose teachers having high-pitched voices.

Whispering has a very bad effect on the voice because the use of the sounding board and the resonance chamber is eliminated

and replaced by breathy, whistling tones passing direct from the glottis into the mouth. This ineffective way of producing tones is gradually adopted in speaking and eventually for singing too. Most of the power of the natural voice is then lost and the most desirable qualities are taken away.

We find through the study of comparative anatomy that man's vital organs have much similarity to those of several species of the lower animals, but the position of these organs is from one to two inches lower in man than in the relative part of the body of the lower animals. Another peculiarity in man, which is of special interest in the study of the vocal organs, is the fact that most of the change in position usually takes place at the age of from twelve to fourteen.

The evolutionists consider this phenomenon as evidence in support of their theory. It is of special interest to the student of

the science of tone production because it happens at the age when the voice undergoes a change and the break which so commonly appears then between the superior and the middle registers is most likely caused by the dropping of the base of the lungs. It stretches them in such a way as to weaken that part of the controlling force, and the child usually discontinues the use of the tones which necessitate the action of the disturbed parts.

A glance at Plate No. 10 will suffice to satisfy an observer that the part of the lungs at the point of contact, between the middle and the superior registers, is the least substantial and it is here that most of the stretching has to take place when the base drops while the top is firmly held up by the clavicular muscles.

It is essential for the child's health and physical appearance, as well as urgent for

the proper development of his voice, that the weakness be strengthened as soon as it appears. It may be prevented by anticipating it with proper breathing and the exercises which require the action of the superior register for its basic part, but mostly in tones of the lower part of the superior register. This quality of tones may be brought down into the middle register to the tones B, A, and even G to advantage.

As soon as the internal muscular controlling force from the tone A of the middle register to F of the superior register has returned to its normal condition through a natural growth, the child is ready to take up the study of the science of tone production as presented in the preceding chapters.

With a child whose voice has been guarded until adolescence, the adjustment and the balancing of the voice are usually the im-

portant points in teaching him the science of tone production because in eliminating the break he has been asked to carry the tones of the high register below the natural condition. A similar trouble, only greater, is often met in the case of the natural artist. He sings the middle B, C, D differently when these tones are the highest than he does when they are the lowest of a composition. When the voice has matured and has been scientifically placed, each and every tone has but one adjustment and should be directly caused by the register and through the bronchia to which it belongs.

QUESTIONS FOR TOPICAL REVIEW

What is the usual cause of monotony in children's voices?

What have you to say concerning a baby's tones?

What is the quality of a child's voice?

The Child's Voice

What is the cause of the high pitch in a child's voice?

In what way are low pitch tones attempted by children?

Why is whispering detrimental to the quality of the voice?

What are the points of interest in the anatomical comparison of man's vital organs with those of lower animals?

What inference in regard to man's voice can you make from the dropping of his vital organs?

What is the natural cause of the break which takes place with the change of the voice?

How should the break caused by the change of voice in a child be treated?

How can the break be prevented?

How should a child's voice be exercised to prevent or eliminate the break?

When is a child in a condition to begin the study of the science of tone production?

What are the most important points to observe in teaching the science of tone production to a child?

CHAPTER XVIII

Hygiene

The oral cavity and the appendages it contains have been added to the vocal organs proper for the articulation of musical tones.

These organs are of great importance to the welfare of the Ego, for through them the first step in the process of digestion is taken. This is the special purpose for which Nature intended them; so it is by having this special purpose in view and the part they have towards the welfare of the general organism that we can assure their health and strength, as well as their entirety.

The teeth should concern us the most, for it is not any too soon for civilized man to take notice that his descendant of the

near future will be an edentate if he permits the modification of these organs to keep on at the rate it is now going.

The typical set of teeth in man is forty-four. The number has been gradually reduced. Thirty-two is the number now considered to be a complete set; but in the centers of high civilization half of the present generation have not the third molars. With many, the four second bicuspids are lacking and a few have not the superior laterals.

This last reduction brings the number to twenty-two, exactly one-half the typical set. The depreciation in the texture, the increased percentage of organic matter in the remaining teeth, is still much more alarming than the reduction of the number. An adult possessor of a sound set of teeth is a cause of wonder now; while the skeleton of the cave-man shows that the teeth in

his time were very powerful and usually sound.

Doctors prescribe tooth brushes to be used daily, polishing powders, pastes, and mouth washes. These things are all right as far as they can protect, but they do not build. This can be accomplished only through natural exercise. A smoothed end of a lamb chop or a chicken bone is much more interesting to a teething child than all the rubber and ivory devices generally used. Let us bring up a child in the open air and in the sunshine and on a wholesome, simple diet so that he can find delight in a half-hour's nibbling at a buttered crust of whole-wheat bread and his mouth will be found to be a delight to look at. The germs, if any, will be powerless on the teeth.

All our faculties require exercise in the way Nature intended in order that they

may acquire their normal development. Chewing gum or anything not intended to be swallowed and nutritive is detrimental to good health because it increases the action of the salivary glands at a time it is not wanted.

A child should have freedom and plenty of opportunity to use his voice without restraint. This would prevent a large percentage of the nose, throat, and lung troubles.

The vibrations of the tones against the ethmoid bone and the walls of the resonance chamber act as a massage on them. The circulation of the blood is thereby increased; and good airing, which is absolutely necessary for the health of cavities lined with mucous membrane, is abundantly supplied.

On account of the air being often contaminated, a child's nostrils should be carefully attended to. Morning and night,

while the child is resting on his back, a drop of sweet oil or a saturated solution of boric acid should be dropped in each nostril. The use of a few fibers of absorbent cotton twisted on the end of a toothpick facilitates the application and removes all danger of discomforting the child with too great a quantity. If this application be followed with a gentle massage or two or three slight pinches and the child be made to blow some air through his nostrils, he will be relieved of all objectionable matter that may have been drawn in with the air. As soon as the child is able to attend to his own toilet, the oil may be replaced by a simple sniff of water, held in place for an instant by pressing the nostrils between the thumb and index finger. This is an important part of one's toilet because it frees the tender mucous membranes of these cavities from all irritating matter and lessens the

danger of breathing through the mouth. If water irritates, it is because the mucous membrane is not healthy; in that case some soothing lotion should be used instead.

A child should be taken out every day, and as soon as he is able he should be made happy with the practice of out-of-door games.

The voice is at its best when a person is buoyant with good health. This happy condition is attained by living as nearly as possible the way Nature intended us to live. Sobriety and physical exercise are the best means of attaining good health and long life. Alcohol and tobacco are injurious to the general health and especially harmful to the voice.

Out-of-door exercises such as walking, climbing hills, playing ball, etc., are necessary to good health and especially desirable

for the quality of the voice, because deep, full respirations are induced by these exercises.

Deep respirations should be practiced all through the day, and all through life as much as possible.

The exhaustion following a sigh of contentment by counting legato is an excellent way of bringing on this favorable condition even while in bed. It should be used freely in the sick-room. It brings on deep respirations at the least possible expenditure of energy and effects a general relaxation, an ideal condition for naturally mending all physical ills. Good health, power, and success are attained with the use of the control. The exercises are all the more beneficial to the physique when practiced with the object of gaining artistic ability.

The vocal exercise of Plate No. 19 may be practiced with advantage in using full

respirations in singing and speaking. It will be especially beneficial to the orator,

PLATE No. 19
Exercise to be practiced with full lungs

if practiced with the thought that a spoken phrase having somewhat the same intervals would be more effective than if rendered in a monotonous way. The fullness and good control required to sing the whole

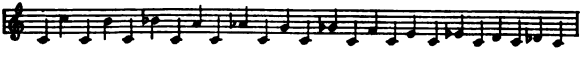

PLATE No. 20
Exercise for an extra fine adjustment

phrase in one breath should be adopted in simple breathing all through the day.

The exercise of Plate No. 20 will be as beneficial to the art of oratory as to that of singing because changes of half tone in the

pitch are very effective if artistically rendered. This exercise is also excellent training to the hearing, through which the mental picture of a sound is prompted.

The monotone exercise is an excellent practice also. It is done by reading, speaking, or singing a whole phrase on one pitch, taking in turn all the tones in the range of the voice. These vocal exercises are in line with artistic training and they combine systematic, full, and deep breathing exercises which are the most beneficial to the vocal organs and the general health.

QUESTIONS FOR TOPICAL REVIEW

What are the articulating organs?

What is the natural purpose of the articulating organs?

What is the number of a typical set of teeth in man?

What is now considered a complete set of teeth?